

at other times it usually takes refuge in an untenanted old shell of the common whelk (*Buccinum undatum*), where it is secure from the gobies and other fishes in the tank, and where it watches—as one can see its fellows do so at any time on the sea-coast in the middle of a rock-pool—expecting the return of the tide and prepared to adapt itself thereto. In “A Year at the Shore,” pp. 215–16, Mr. P. H. Gosse, F.R.S., mentions, on the authority of Mr. Ross, of Topsham, the case of a blenny which for five months proved “a regular and correct tide-indicator,” spending a portion of its time on the rock-work, and going back to the tank at the time of the return of the tide.

I quite agree with Mr. Arthur R. Hunt's idea that it would be a great gain if we could copy Nature a little closer, and have “working-models of the sea in some of our new aquariums.”

Birmingham, July 22

W. R. HUGHES

### Artificial Earthquakes

PROF. MILNE'S experiments with artificial earthquakes in Japan, noticed in NATURE of June 4 (p. 114), show that the vertical free surface-wave had the quickest rate of transit, and this was taken to account for the preliminary tremors of an earthquake. The normal wave travelled with a less velocity, and the transverse wave slowest of all. In the earthquakes which occur here from time to time there are generally, if not always, two distinct shocks felt, and it is possible that the second is the transverse wave following on after the swifter normal vibration. I have not heard that there are any seismographs in the Punjab, and in the alarm of the moment it is not easy to notice the direction of the motion without apparatus; fortunately our earthquakes do not leave any automatic record in the shape of fissures or fallen buildings. But Prof. Milne's experimental results are curiously confirmed by observations in Kashmir during the earthquakes of this month, which do not appear yet to have quite subsided. The Kashmir correspondent of the *Lahore Civil and Military Gazette* of to-day's date writes as follows:—“The more severe shocks seemed to be followed by others in a different direction, like cross waves. I noticed this in a boat which quivered all over during a severe earthquake, but rolled somewhat afterwards.”

T. C. LEWIS

Government College, Lahore, June 29

### The Recent Earthquake in Switzerland

THE following is a table of events of the earthquake in Switzerland of June 20 last, compiled from numerous and interesting observations of the phenomenon, obligingly forwarded to me from all parts of the country.

The earthquake consisted of a series of shocks:—

1. *Preparatory Shocks*.—Very weak and ill-defined from midnight to 3 a.m.; at Neuchâtel and Chaud-de-Fonds.

2. *Great Shock*.—At 5.16 on the morning of June 20; at the centre of the earthquake.

3. *Consecutive Shocks*.—At 7.26 a.m. June 22 at Neuchâtel; at 8.30 a.m. of June 22 at Yverdon, Payerne, Estavayer, Concise, Boudry, Neuchâtel; at 11 a.m. of June 23 at St. Imier; at 2.30 p.m. of June 23 at Neuchâtel; at 9.20 a.m. of June 24 at Yverdon (?)

The great shock had its centre near Yvonand and the central area may be defined by the triangle formed by Yverdon, Neuchâtel and Payerne. The shock was strong enough to alarm the inhabitants, to displace some articles of furniture and even to throw down a chimney at Payerne. I assign to the shock the strength of number 6 on the scale of intensity, of which number 10 would stand for the highest degree. The shock was felt more feebly in a vast territory extending as far at least as Geneva, Le Brassus, Le Locle, Bâle, Glaris, Thun, Saxon: that is, it traversed the whole plain of Western Switzerland from the Jura Alps. A subterranean noise was heard very distinctly in the whole central area and even a little beyond it.

The shock had very markedly the character of successive oscillations, horizontal or vertical, their direction differing according to the locality. Such is, indeed, the usual type of earthquakes, as has been shown by the study of them with registering instruments, and it is interesting to notice that the various observations of the earthquake of June 20 all perfectly concur in ascribing to it this character.

F. A. FOREL

Morges

### THE PITCHER PLANT

THE variety of the Pitcher Plant (*Sarracenia variolaris*) found in North America is carnivorous, being a feeder on various animal substances.

Mrs. Mary Treat, an American naturalist, made, a few years ago, several experiments upon the plants of this species to be found in Florida; and to the labours of this lady the writer has been indebted, in some measure, in the preparation of this paper.

The *Sarracenia* derives its name of “Pitcher Plant” from the fact of its possessing the following curious characteristics. The median nerve is prolonged beyond the leaves in the manner of a tendril, and terminates in a species of cup or urn. This cup is ordinarily three or four inches in depth, and one to one and a half inches in width. The orifice of the cup is covered with a lid, which opens and shuts at certain periods. At sunrise the cup is found filled with sweet, limpid water, at which time the lid is down. In the course of the day the lid opens, when nearly half the water is evaporated; but during the night this loss is made up, and the next morning the cup is again quite full, and the lid is shut.

About the middle of March the plants put forth their leaves, which are from six to twelve inches long, hollow, and shaped something like a trumpet, whilst the aperture at the apex is formed almost precisely in the same manner as those of the plants previously described. A broad wing extends along one side of the leaf, from the base to the opening at the top; this wing is bound, or edged with a purple cord, which extends likewise around the cup. This cord secretes a sweet fluid, and not only flying insects, but those also that crawl upon the ground, are attracted by it to the plants. Ants, especially, are very fond of this fluid, so that a line of aphides, extending from the base to the summit of a leaf, may frequently be observed slowly advancing towards the orifice of the cup, down which they disappear, never to return. Flying insects of every kind are equally drawn to the plant; and directly they taste the fluid they act very curiously. After feeding upon the secretions for two or three minutes they become quite stupid, unsteady on their feet, and whilst trying to pass their legs over their wings to clear them, they fall down.

It is of no use to liberate any of the smaller insects, every fly, removed from the leaf upon which it had been feeding, returned immediately it was at liberty to do so, and walked down the fatal cup as though drawn to it by a species of irresistible fascination.

It is not alone that flies and other small insects are overpowered by the fluid which exudes from the cord in question. Even large insects succumb to it, although of course not so quickly. Mrs. Treat says:—“A large cockroach was feeding on the secretion of a fresh leaf, which had caught but little or no prey. After feeding a short time the insect went down the tube so tight that I could not dislodge it, even when turning the leaf upside down and knocking it quite hard. It was late in the evening when I observed it enter; the next morning I cut the tube open; the cockroach was still alive, but it was covered with a secretion produced from the inner surface of the tube, and its legs fell off as I extricated it. From all appearance the terrible *Sarracenia* was eating its victim alive. And yet, perhaps, I should not say ‘terrible,’ for the plant seems to supply its victims with a Lethe-like draught before devouring them.”

If only a few insects alight upon a leaf no unpleasant smell is perceptible during, or after, the process of digestion; but if a large number of them be caught, which is commonly the case, a most offensive odour emanates from the cup, although the putrid matter does not appear to injure in any manner the inner surface of the tube, food, even in this condition, being readily absorbed, and going to nourish the plant. In fact, it would seem tha

the *Sarracenia*, like some animals, can feed upon carrion and thrive upon it.

In instances in which experiments have been made with fresh, raw beef or mutton, the meat has been covered in a few hours with the secretions of the leaves, and the blood extracted from it. There is, however, one difference between the digesting powers of the leaves when exercised upon insects or upon meat. Even if the bodies of insects have become putrid, the plant, as has already been stated, has no difficulty in assimilating them; but as regards meat, it is only when it is perfectly sweet that the secretions of the leaves will act upon it.

The Pitcher plant undoubtedly derives its principal nourishment from the insects it eats. It, too—unlike most other carnivorous plants, which, when the quantity of food with which they have to deal is in excess of their powers of digestion, succumb to the effort and die—appears to find it easy to devour any number of insects, small or large, the operation being with it simply a question of time. Flies, beetles, or even cockroaches, at the expiration of three or four days at most, disappear, nothing being left of them save their wings and other hard parts of their bodies.

The *Sarracenia* is, indeed, not only the most voracious of all known species of carnivorous plants, but the least fastidious as to the nature of the food upon which it feeds.

W. C. M.

#### THE ECLIPSES OF AUGUST, 1886

IT has been before stated in NATURE that the total solar eclipse of August 28-29 next year can be most favourably observed on the west coast of Africa near Benguela. In a recent number of *Science* Mr. Skinner supplies a valuable account of the local conditions, which we here reprint:—

"Benguela is about 400 miles south of the mouth of the Kongo, and about 200 miles south of the mouth of the Koanza. The climate of the lowlands bordering the coast near Benguela is fatally unhealthy for strangers, making it compulsory, on the score of prudence, for an observing party to penetrate the interior sufficiently to attain the mountainous highlands which lie not far inland.

"The American Board of Commissioners for Foreign Missions has for some three years occupied two mission stations in this region—viz. Bailundu, about 133 miles eastward from Benguela, and Bihe, about 70 miles south-east from Bailundu. Through the courtesy of Rev. Judson Smith, D.D., secretary of the American Board, and Mr. Frederick A. Walter, secretary of this west-central African Mission, I have received definite statements of some of the precautions necessary, and some of the difficulties to be encountered by an observing party locating in this region. I will give in brief the points with which Mr. Walter favours us.

"Dangers to the person from savages are not to be apprehended. The climate of Bailundu and vicinity is exceedingly salubrious. During a residence of nearly three years, Mr. Walter and his family have experienced no illness to be ascribed directly to the climate, but in every case to overwork, over-exposure to the sun, or want of proper food.

"The difficulties in reference to transportation are considerable. Transportation is done entirely by men; waggons and animals cannot be used. The gross weight for a carrier is from 65 to 70 lbs.; commonly it does not exceed 58 lbs. Packages, either bales or boxes, should be of about the following dimensions:—14 inches by 9 inches by 30 inches, or, if more convenient, 16 inches by 10 inches by 24 inches. No single package should exceed 18 inches in width by 10 inches in depth. Pieces not exceeding 60 lbs. in weight, though 8 or 10 feet long, can be carried by a single carrier.

"As to means of subsistence, an observing party must

bring *all their supplies with them*, as it is essential to the health of newcomers that they should live on food to which they are accustomed. The time required for a round trip of a caravan from Bailundu to Benguela may be stated as one month to six weeks.

"Mr. Walter states that the chances for clear sky at the time of the eclipse are very favourable.

"It may be stated that the land rises very abruptly as one leaves the coast from Benguela, and in a few miles attains a very considerable altitude, and throughout these highlands the climate is very healthful."

#### INTERNATIONAL INVENTIONS EXHIBITION

SELF-ACTING or automatic machinery has made wonderful strides of late years, and its progress in the special department of watch-making cannot be more advantageously studied than in the beautiful display of machine tools now exhibited by the American Waltham Watch Company at South Kensington. We think that a few remarks with reference to the functions of these tools may be of service to the readers of NATURE when viewing the collection. The machine tools are all labelled, and can readily be identified.

(1) A screw-making machine.—This machine is engaged in producing watch jewel screws; the size of the screws may be appreciated when we state that it takes more than 8500 to weigh one ounce troy. Lengths of wire are transformed into these tiny screws in the following manner. The machine is fed with the wire through a hollow mandrel, the wire is seized and rotated rapidly, a movable cutter is brought against it, and immediately the body of the screw is turned. Two dies are at hand which attach themselves, and they cut the thread; on reaching the limit of their cut, they pull out the wire a distance, the thickness of the screw head, for hitherto the wire has only projected the length of the body of the screw through the mandrel head. The dies disengage themselves, and a second cutter cuts off the screw at its junction with the mandrel head. There is an alternating arm, the most conspicuous part of the machine: this takes possession of the screw as it is cut off, and, carrying it to a different part of the machine, holds the head against a small circular mill, where the notch is cut. The screw is now finished, and is discharged into a magazine by a kind of ramrod. The machine turns out 4000 screws a day, and indeed the successive operations go on with so much rapidity, that it requires some practice to follow them. It is to be noticed that when the dies are cutting, the wire is stationary, and the machine then quickens its motion to save time. When the dies pull forwards, the chuck holding the wire opens simultaneously. Copious streams of oil are supplied to wash away the shavings, and the oil after being used once, escapes into reservoirs from whence it is automatically pumped up again. The different parts of the machine are regulated almost entirely by cams, the dies by a very elegant arrangement of opposing toothed sectors.

(2) A machine for cutting off dial feet—*i.e.* attachments. If this machine stood alone it would be interesting, but it is overshadowed by its neighbours.

(3) A machine for roughing out staves or pinions.—This is similar in some respects to the screw-making machine. Lengths of wire are fed through the mandrel, and a cutter shapes one end of the staff or pinion, giving it a male centre. It is then cut off, but the other end has to be shaped with its male centre too. Again we have an alternating arm, which carries the pinion away and places it in a very similar mandrel on the other side. So soon as it is gripped it begins to rotate; a cutter comes and shapes the unfinished end with its male centre. When done it is discharged into a magazine, as the tiny screws were.

(4) This is a machine for trueing down the staves or